

We crammed a lot into this one paper for convenience.

**OBJECTIVES:**

1. Develop a working definition of the “universe” of roads, based on FPA definitions, literature and other sources;
2. Develop a screening approach to determine which roads/segments (subject to the FPA and pre-FPA) have the potential to deliver sediment to streams, based on the characteristics of roads and road segments.
3. Rank these roads or segments according to risk of delivery (e.g., high, med, low), based on the characteristics and screening criteria developed.
4. Develop an inventory and assessment approach (potentially) using areas of the MidCoast Basin as pilot.
5. Ensure criteria & necessary outcomes expressed in CZARA/ CNPCP documentation is addressed (relevant sections will be provided prior to meeting).
6. Prepare for proposed BOF-EQC Tour in April (updates on this?);
7. As a straw man proposal, whatever approach/actions we agree upon is referred to hereafter as “Oregon’s (ODF-DEQ) PENDING approach” or similar, so that the wording is in the format of a draft response to the EPA/NOAA concerns on the CNPCP measures.

Specifically, DEQ and ODF will discuss approaches and technical issues consistent with the following proposed ***Elements of an Oregon Approach to Meeting CZARA/CNPCP Additional Measures for Forestry (Roads):***

- (a) develop appropriate definitions and identification of the universe of roads/segments having potential for delivery of sediment to streams, based on road characteristics, including “Legacy” roads;
- (b) develop relative ranking system for “risk” (low, med, high) of roads/segments for potential for delivery of sediment to streams, based on characteristics defined in (a);
- (c) develop an inventory and condition & characteristics assessment approach using appropriate techniques to sample a representative subset of the road network for potential for delivery of sediment to streams; discuss RIM and GRAIP approaches (e.g., \*Coos WA/Elliot SF OWEB application # 212-2045);
- (d) conduct an evaluation of the universe of roads/segments of concern, initially focused on specific areas of the MidCoast Basin, using the condition & characteristics assessment approach from element (c);
- (e) develop a problem statement and outline for funding proposal to complete (d) (i.e., OWEB TA grant);
- (f) meet with partners to discuss development of OWEB funding proposal (Feb 2012);
- (g) develop a prioritization scheme and general schedule for corrective actions to address roads/segments that have a higher risk for delivery of sediment to streams;
- (h) implement corrective actions for roads/segments identified as higher risk for delivery of sediment to streams;

- (i) Document & Report management actions taken on roads/segments at higher risk for delivery of sediment to streams;
- (j) Re-evaluate a subset of the roads/segments in \_\_\_\_ years for improvement following management actions;
- (k) Re-evaluate whether waterbodies are meeting water quality standards and targets in \_\_\_\_ years;
- (l) Seek funding and develop partnerships to accomplish above elements;
- (m) Consider relationship of approach and management actions to Forest Roads NPDES permits;

In developing these elements, it will be important to ensure that the “additional measures for forestry” (roads-sediment) & expected outcomes expressed in CZARA/ CNPCP documentation are addressed (relevant sections will be provided). Our expectation is that we can identify through this collaborative process where FPA or other programs (Oregon Plan voluntary measures) meet the above criteria (or can be adjusted to do so), or where additional measures may be necessary to satisfy EPA/NOAA concerns.

#### **PROPOSED ROADS WORKING GROUP AGENDAS:**

**Meeting #1 (1/9/12): Background/problem statement; Overview & discuss all elements; cover (a) – (c) in detail; ID potential approach to element (d); Discuss proposed BOF-EQC Tour in April;**

**Meeting #2 (late Jan): Review Meeting #1 highlights & action items; approaches to element (d) and (e);**

**Meeting #3 (mid-Feb): Field trip: Identify locations, contact landowners and Meet at field site(s); prepare for BOF-EQC Tour in April;**

**Meeting #4 (late Feb): Review Meeting #3 highlights & action items; approaches to (f)-(i);**

*Items (j) - (m) need to be considered (in the background);*

## BACKGROUND - ISSUES AND APPROACHES

EPA/NOAA raised the issue of “legacy” roads in the CZARA/CNCP Program documentation (1998, 2004) as an outstanding “measure” and one basis that they have not fully approved Oregon’s CNCP Program. EPA/NOAA have since provided additional information to clarify their concerns with forest roads and natural resource protection, in relation to the approval of Oregon’s CNCP Program.

For purposes of this evaluation, “legacy” roads is proposed to be defined as: *those roads/segments constructed before the effective date of the Oregon FPA (1972)*. (See section below “Does age matter?”)

Pre-1972 roads were not subject to construction or maintenance standards and no specific requirements for abandonment or “vacating” roads was in place prior to 1972. Following 1972, a series of revisions to the FPA and associated roads construction and maintenance rules were enacted (see table 1. & associated narrative below) that make defining the effective age or date of a road/segment a moving target and thus an unreliable indicator of either condition or negative effects on soil and water.

**Does age matter?** Why Oregon’s (ODF-DEQ) PENDING approach addresses the issues raised by EPA/NOAA in CNCP documentation between 1998 and present.

Following numerous discussions and clarifications, it is apparent that **the primary concern EPA/NOAA concerns Private Forest roads (i.e., both FPA regulated and those pre-FPA) that have a potential to deliver sediment to streams and thereby pose a risk of negative impacts to natural resources, including water quality, aquatic life and other beneficial uses.** Oregon’s (ODF-DEQ) PENDING approach addresses roads of various age categories, and is not limited to so-called “legacy” roads referred to in the CZARA/CNCP documentation (1998, 2004).

Based on ODF-DEQ discussions thus far, we conclude that age is both difficult to determine and may be of little value in assessing road characteristics, with a few exceptions. Since a large proportion of private industrial forest roads were constructed to one standard, then re-constructed to newer standards, and possibly later maintained/upgraded to current or newer standards, the applicable BMPs and characteristics of the road/segment have probably changed multiple times since construction. What is of primary interest in the current characteristics of the road/segment. General classification of road/segment in relation to water quality and beneficial use protection is best done by characteristics, all or most of which are identified in existing documentation (see below).

Roads both constructed & abandoned pre-FPA (not active since 1972) should be defined as a separate category, to the extent that these roads/segments can be identified, since they are not under FPA (ODF) jurisdiction. However, a large proportion of the road miles in this category may have mature vegetation growing on them and are thus inaccessible for either assessment or use of current “vacating” practices to ensure that they are not a source of sediment. These roads or segments were generally replaced by more current roads to access harvest units after 1972 (Mills paper; P. Daugherty pers comm).

**Screening Approach:** Oregon’s (ODF-DEQ) PENDING approach will use a screening approach to determine whether private forest roads have a potential to deliver sediment to streams, based on characteristics of

roads/segments. The screens are taken from various sources of published information, primarily from the Oregon Dept of Forestry.

Characteristics of roads/segments. The first screen is road segment location, a defining characteristic that affects proximity of the road to waterbodies at various places along its length and whether a segment is located in a higher risk location (identified below)\_\_\_\_\_.

In Technical Note Number 7, ODF identifies the following characteristics of poorly located roads/segments: The key here is to reduce or eliminate roads in the following locations:

- where fill is placed in stream channels
- in riparian management areas
- crossing wetlands
- on high landslide hazard locations, especially when rock is weak
- cutting across the toe of old landslide deposits above streams
- on steep slopes with easily eroded soils (granitics)

<http://www.ohcs.oregon.gov/ODF/privateforests/docs/CriticalRoadLocationsFPTechNote7.pdf>

The second bullet includes road segments that are along streams. Road segments with these six location characteristics are considered poorly sited and generally pose a higher risk of sediment delivery to streams than other road segments. Many roads/segments are on flat terrain or near ridge tops where they do not cross streams and thus have no potential to deliver sediment to streams or block fish passage.

Oregon's (ODF-DEQ) PENDING assessment of road characteristics, and associated potential to deliver sediment to streams, is a necessary step in establishing a "Program" to address one of the outstanding "additional measures for forestry" identified in the EPA/NOAA documentation on approval of Oregon's CNPCP. It is also a necessary step in developing and meeting the Oregon Plan ***Oregon Indicator of Sustainable Forest Management D.c. : Forest road risks to soil and water resources*** <http://www.oregon.gov/ODF/indicators/indicatorDc.shtml>

Elements of Oregon's (ODF-DEQ) PENDING Program have been developed under the FPA and Oregon Plan. Generally, what is lacking is a codified road inventory and assessment requirement and an associated implementation program (per EPA/NOAA). Much of the upgrades that have been completed to date have not been tracked. These actions were either required to meet new FPA standards, follow guidance, or were voluntary measures completed under the auspices of the Oregon Plan.

Perceived summary of gaps in current FPA (according to EPA/NOAA):

- No specific road inventory and assessment requirement; no GIS based inventory.
- No required methodology when road inventory and/or assessment are conducted
- No inventory & tracking of Oregon Plan voluntary actions at a geographic specific level

Both the need and the value of a comprehensive road inventory and assessment/tracking program was also identified by ODF in the ***Oregon Indicator of Sustainable Forest Management D.c. : Forest road risks to soil and water resources*** <http://www.oregon.gov/ODF/indicators/indicatorDc.shtml>

Significant private and public (OWEB) expenditures have been made to upgrade the road network on land under private industrial ownership under the Oregon Plan (OR PLAN reporting \_\_\_\_\_). EPA/NOAA (2004) recognized this investment has played an important role in improving road conditions and fish passage, but repeatedly expressed that it is inadequate to meet CNPCP measures because it is not an enforceable “Program” and because it does not provide a verifiable reporting and monitoring component that would show that the management actions being reported are actually resulting in improvements \_\_\_\_\_. ODF reached this same conclusion in ***Oregon Indicator of Sustainable Forest Management D.c. : Forest road risks to soil and water resources.***

## SOLUTIONS

Several solutions have been discussed to satisfy EPA/NOAA concerns, including:

1. Adoption of a forest practices rule system equivalent to that in Washington’s Forest and Fish Law (Road Maintenance and Abandonment Plans (RMAPs)).
2. Development of an Oregon “Program” that contains verifiable forest roads inventory, monitoring and reporting components showing that the management actions being reported result in meeting standards and necessary improvements to protect resources.
3. Management requirements akin to NW Forest Plan (NWFP) on US Forest Service lands.

Oregon (ODF-DEQ) has concluded that the best (PENDING) solution is to: develop an Oregon “Program”, building on existing efforts and addressing gaps. The starting point would be to: Develop a draft screening approach to determine which roads subject to the FPA have a potential to deliver sediment to streams, based on characteristics of roads/segments. Rank these according to risk of delivery (e.g., high, med, low) using specific areas of the MidCoast Basin\* (elements (a)-(i) identified above). This assessment may be combined with information from other assessments conducted by ODF on state-managed forestlands within three watersheds (Miami, Upper Nehalem, and Wilson).

*NOTE: Similar monitoring was planned as part of the Oregon Plan for Salmon and Watersheds - Road Hazard Identification and Risk Reduction project, but has yet to be implemented.*

**\*OWEB Region 2 (primarily South Coast):** There is a history of well-designed and executed road surveys and studies (TA grants) and road upgrades or decommissioning conducted (restoration grants).

One similar road assessment activity has been proposed (not yet conducted) in OWEB Region 1, in the MidCoast Basin. Other efforts include rapid road survey protocol proposed by this indicator but limited to state-managed forestlands within three watersheds (Miami, Upper Nehalem, and Wilson) and federal efforts in the Siuslaw NF. None of those were OWEB-funded projects.

There may be a variety of reasons for this, including physical constraints and socio-economic factors. The MidCoast Basin has some complex ownership patterns (see map), including multiple private timber ownership interspersed with other ownership, although this situation is not unique to the Oregon Coast Range. Also, some private forest landowners may believe that their management actions to date are in compliance with FPA and

therefore it is not necessary to do anything “beyond compliance”. Also, long-term studies of the effects of multiple forestry activities, including road networks, are being conducted in North Coast area (Wilson-Trask).

Oregon (ODF-DEQ) PENDING approach believes that private ownership in the MidCoast is an appropriate candidate for road inventory and assessment work, including methods like the GRAIP method. DEQ is working with USFS - Siuslaw NF and others to determine whether a modified GRAIP method is viable and would produce results that would be adequate to perform the classification of road system for risk of sediment delivery and provide a relative ranking of for prioritization of road segments for upgrades or decommissioning by landowners. The purpose of the modified approach would be to address more road miles at a reduced cost, given that a full GRAIP assessment and analysis is both comprehensive and yet highly resource intensive.

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#### References:

GRAIP: [http://www.fs.fed.us/rm/boise/AWAE/briefing/Luce\\_FocusOnGRAIP.pdf](http://www.fs.fed.us/rm/boise/AWAE/briefing/Luce_FocusOnGRAIP.pdf)

<http://www.fs.fed.us/rm/boise/publications/misc/LuceRoadInventoryWatershedAnalysis.pdf>

<http://www.ohcs.oregon.gov/ODF/privateforests/MonitoringForestRoads.shtml>

**GUIDANCE:** <http://www.ohcs.oregon.gov/ODF/privateforests/docs/guidance/OARDiv625.pdf>

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#### DEFINITIONS

Excerpt from *Forest Practices Advisory Committee on Salmon and Watersheds*, Section B; FPA Standards and Rules (\_\_\_\_ date); <http://www.oregon.gov/ODF/privateforests/docs/RptSecB.pdf>

see also the State Forests Road Manual (2006) APPENDIX 6. ROAD TERMINOLOGY (Mainline, connector, Spur, etc): [http://www.ohcs.oregon.gov/ODF/STATE\\_FORESTS/roadsmanual.shtml](http://www.ohcs.oregon.gov/ODF/STATE_FORESTS/roadsmanual.shtml) [http://www.ohcs.oregon.gov/ODF/STATE\\_FORESTS/docs/management/roads\\_manual/RMAppendix6.pdf](http://www.ohcs.oregon.gov/ODF/STATE_FORESTS/docs/management/roads_manual/RMAppendix6.pdf)

For the purposes of this issue paper, the following definitions will apply. A “road” normally refers to truck (sometimes called “haul”) roads. Skid roads or trails (used by tracked or wheeled skidding machines to move logs from the stump to the landing) are only addressed in relation to ground-based harvesting on steep slopes in this issue paper. The Forest Practices Rules recognize three types of roads:

1. **Active:** Roads used for removing commercial forest products (regardless of the year constructed).
2. **Inactive:** Roads used for forest management purposes other than log hauling (regardless of the year constructed).
3. **Vacated:** Roads that have been purposely “put to bed”, stabilized, and are impassible.

Current road maintenance rules (see Attachment A) require **maintenance** of both “active” and “inactive” roads. The term **“legacy” road** is not defined in the administrative rules. It is widely used in the public dialogue regarding forest road issues and has a different meaning depending on when and where it is used. ODF considers “legacy” roads to be synonymous with “abandoned” roads. Regardless of when a road was built, if it has been used for hauling logs or forest management since 1972, it is subject to regulation under the Forest Practices Act. The term

“older” road is also used sometimes. The administrative rules continually evolve in response to changes in scientific knowledge; since the creation of the 1973 administrative rules, **major revisions to the road rules occurred in 1978, 1983, and 1994**. ODF considers “old” roads to be those built prior to the 1983 rule changes (i.e., roads built before end-hauling of material excavated from the road prism on steep slopes).

**Road maintenance** is required on all active and inactive roads. Regardless of when a road was constructed, if the road has been used as part of an **active operation after 1972**, it is subject to all maintenance requirements within the current rules.

Abandoned roads constructed prior to 1972 and not used for forest management since that time are not subject to Forest Practices regulatory authority. All roads in use since 1972 must either be maintained or vacated by the operator.

The department estimates that the majority of existing forest roads were constructed prior to 1983 (in other words, prior to rule changes which improved construction practices on steep slopes).

One area not directly addressed by the rules is sediment problems related to road use. Increased turbidity can be associated with the use of roads during rainy or thawing periods (Bilby et al., 1989; Reid and Dunne, 1984). Currently, within the guidance for the road maintenance rules, operators are directed to stop hauling when FPFs observe high levels of turbidity entering streams. However, there are currently no rules that address the specific level of turbidity that is considered acceptable during wet season hauling.

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#### **FPAC... V. Evaluation of Measures and Rules - Voluntary Measures**

...To this end, many private landowners and State Forests have been implementing the Road Hazard Identification and Risk Reduction Project since 1997. Thousands of miles of roads have been inspected and repaired as part of this project (Oregon Plan Report, 2005). However, there is no consistent monitoring of how road conditions improved after these repairs.

<http://www.oregon.gov/ODF/privateforests/docs/RptSecB.pdf>

**Oregon Indicator of Sustainable Forest Management D.c. ; Forest road risks to soil and water resources**

<http://www.oregon.gov/ODF/indicators/indicatorDc.shtml>

**Does age matter?** Why Oregon’s approach addresses the issues raised by EPA/NOAA in CNPCP documentation between 1998 and present. (Rationale was presented above)

Road Age class (based on major changes to FPA road rules):

- Pre-FPA (<1972)
- 1972-1983 (majority of existing forest roads)
- 1984-1995 (era of major revisions to FPA)
- 1996-2003 (some important changes)
- 2003-present (static?)

Table 1. Road/segment Category classified by age. Large # of categories illustrates why this is not the best way to classify; may be useful for discussion purposes with EPA/NOAA and others.

Road/segment Category	Age (based on date constructed)	Characteristics (Location, etc)	FPA requirement	Risk of sediment delivery (by Class)
Vacated/abandoned ("legacy")	Pre-1972	Vacated/abandoned according to practices of the day	No FPA requirements; DEQ-NPS authority	Variable depending on location, current condition, etc.
Abandoned ("legacy")	Pre-1972	Not used since 1972; never properly vacated	No FPA requirement; DEQ-NPS authority	High(?) ODF: these are "grown over" with 40-yr old trees; confirmed?
Vacated	1972-1983	Largest category (in miles)?	Vacate to rules effective (date)	Variable (High to Med); depending on rules in effect
Vacated	1983-1995		Vacate to rules effective (date)	Variable (Med to Low); depending on rules in effect
Vacated	1996-2003		Vacate to rules effective (date)	Low
Vacated	2003-present		Vacate to rules effective (date)	Low
Active	Pre-1972		upgrade/maintain to rules effective on (date)	High
Active	1972-1983	Largest category (in miles)?	upgrade/maintain to rules effective on (date)	Variable
Active	1983-1995		upgrade/maintain to rules effective on (date)	Low
Active	1996-2003		upgrade/maintain to rules effective on (date)	Low
Active	2003-present		upgrade/maintain to rules effective on (date)	Low
Inactive	Pre-1972		vacate or upgrade as of 1972	This category is the same as vacated pre-1972;
Inactive	1972-1983	Largest category (in miles)?	upgrade/maintain to rules effective on (date)	Variable (High to Med); depending on rules in effect
Inactive	1983-1995		upgrade/maintain to rules effective on (date)	Low
Inactive	1996-2003		upgrade/maintain to rules effective on (date)	Low
Inactive	2003-present		upgrade/maintain to rules effective on (date)	Low

"old" roads	built prior to the 1983 rule changes	Largest category (in miles)?		Variable (High to Med); depending on rules in effect
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Old Roads: built prior to the 1983 rule changes (i.e., roads built before end-hauling of material excavated from the road prism on steep slopes).

Active (1972) → decide NOT to use → Vacate

Inactive (1972) → decide NOT to use → Vacate

Inactive (1972) → decide to use → Upgrade/maintain to NEW FPA standards

Active (1972) → continue to use → Upgrade/maintain to NEW FPA standards

Inactive (1972-present) → decide to use → Upgrade/maintain to standards in place@ DATE Y

Inactive (1972-present) → decide NOT to use → ?? Upgrade/maintain to standards in place@ DATE Y ??

Active (1972-present) → decide to use → Upgrade/maintain to standards in place@ DATE Y

## **MISCELLANEOUS; incomplete.**

Fish passage: Since 1994, the FPA has required juvenile fish passage be provided on all fish-bearing streams.

**Cross drains:** Cross drain structures are installed to protect road surfaces from erosion and retaining water, to reduce erosion of roadside ditches, to prevent ditch water from discharging onto unstable slopes, and to reduce the amount of ditch water (and associated ditch water sediment) discharging directly into a stream. An insufficient drainage design can result in unfiltered surface runoff entering streams. This may have adverse effects on the maintenance and recovery of salmonids. Currently, a large network of active roads exist across forested lands that were not built to current FPA design standards. While old roads<sup>11</sup> may be functioning adequately, it is believed a significant portion of these roads pose an increased risk of fill failure and/or washouts that can adversely affect water quality and the maintenance and recovery of salmonids. Recent monitoring studies have found many existing roads have drainage systems that are not designed to filter sediment. A secondary finding was that steep roads (>12 percent grade) often have inadequate spacing of cross drainage structures (excessive distance between cross drains). These conditions exist mostly on older and, to a lesser extent, on more recently constructed roads.

Recommendation #5: Develop specific standards for roads that will be actively used during the wet season. This would include a requirement for durable surfacing of roads in locations where fine sediment can enter streams. This would also include ceasing to haul if roads have not been constructed with effective surface materials, drainage systems, or other alternatives (paving, increased numbers of cross drains, sediment barriers, settling basins, etc.) that minimizes delivery of sediment into streams.

### **FPA/WQS Pathway: E4 & E5.**

Monitoring/Research: N/A (issue of clarifying existing rule).

## **ATTACHMENTS**

Excerpts from CZARA/CNCP documentation (1998, 2004); sent to Marganne early Dec  
Mills paper

*Keith Mills*

Legacy Roads Discussion for June 30 Non-NPDES Meeting

Comments on Legacy Roads

There is no definition of a "legacy" road in the Forest Practices Act or regulations. The Forest Practices Act has definitions for three types of roads: Active, Inactive and Vacated. Based on legal advice and department guidance any road used for forest management access since the effective date of the Forest Practices Act in 1971 falls into one of these categories. Active and Inactive roads must be maintained as needed to protect water quality as per the nine Sections (BMP's) under OAR 629-625-0600. A vacated road must be stabilized for permanent drainage and slope stability. If it is not stabilized, it is not a vacated road, and falls under the maintenance requirement for an inactive road.

A former road that has not been used for forest management access since 1971 will be covered with trees and other vegetation, have fills which were washed out by the many high flows over the last 40 years, and based on ODF state forests road surveys actually be less connected to streams (less of a risk of chronic erosion) than active or inactive roads. They may still have locations at risk of landslides. However, to access and repair these roads requires clearcutting the trees on the road prism, reconstruction of washed out sections, and then removal of these reconstructed sections. All of these activities will increase chronic erosion for the sake of reducing episodic erosion.

There may be a different understanding of legacy roads on Federal lands (BLM and especially USFS). On these lands, road maintenance budgets have been greatly reduced, and so legacy roads may be considered roads they no longer maintain, but most have been used since 1971. DEQ has designated both federal agencies as Designated Management Agents (DMA's) for water quality, and needs to ensure these agencies are addressing the road issue on federal lands. There may be an incorrect assumption that private and state forest roads are neglected like those on federal lands.

The Oregon Board of Forestry has adopted indicators of sustainable forestry, including a water quality indicator for forest roads for all forest land ownerships. To date, adequate resources have not been provided for this indicator. Despite the lack of dedicated resources, ODF is still working to implement this indicator over next winter on north and central coast forestlands. The extent of road systems, their connectivity to streams, and restrictions on fish passage are the metrics for this sustainable indicator. Hydrologic connectivity and disturbed road area provide the best indicators of chronic sediment delivery from roads.

- Conceptual outline of Washington roads and landslide processes (DEQ – will find WA person to present)
- Current Oregon Plan measures (Road inventory process, past effort to ID legacy roads) – (Ryan Michie – Bobbi Riggors, OWEB)
- 3<sup>rd</sup> party certification (SFI, FSC, Tree Farm) – Roads? (Marganne)
- Examples of ODF inspection summary reports from FACTS (#, activity) (Marganne)
- Ranking of x-ing types (Mike Dewey)

1/23: Conference call to follow-up on (c) & (d) - see page 2 above)

All,

Thank you for taking time to meet last Monday. We realize that significant travel was involved. We covered important ground and circled back to some of the core problem ID and definition issues.

Our managers have asked that we establish a regular meeting time with your team. That could include check-in calls, in person meetings and could include other parties as appropriate or necessary.

Proposed call on 1/26: Keeping tight timeframes in mind, we would like to schedule a conference call to follow-up on items (c) & (d) - see page 2 & 3 above and on original white paper).

We request that working group review the original white paper and any follow-up provided from our Meeting Action Items provided by Marganne (above).

<http://www.cascadepacificstewardship.org/index.html>

Small Woodlands Association; Karen Fleck Harding, KFH Consulting LLC

<http://www.oswa.org/local-chapters2.html>

Five Rivers Landscape Management Plan

Limiting Factors Analysis (LFA) (Bio-Surveys, 2008) in upper Five Rivers

Upper and Middle Five Rivers Limiting Factors Analysis

Baseline data from

1992-97 (ODFW AQI) and 2007 (RBA, Bio-Surveys).